

# Course Manual KL

design and 3D-CAD

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## – General information

**Long name** design and 3D-CAD

**Approving CModule** [KL\\_BaET](#), [KL\\_BaOPT](#)

**Responsible** Prof. Dr. Michael Gartz  
Professor Fakultät IME

**Valid from** winter semester  
2021/22

**Level** Bachelor

**Semester in the year** winter semester

**Duration** Semester

**Hours in self-study** 60

**ECTS** 5

**Professors** Prof. Dr. Michael Gartz  
Professor Fakultät IME

**Requirements** mathematics  
elementary geometry  
three-dimensional  
spatial sense

**Language** German

**Separate final exam** Yes

## Literature

Hoischen, Technisches Zeichnen, Cornelsen

Krause Werner, Grundlagen der Konstruktion,  
Hanser

Decker Karl Heinz, Maschinenelemente, Funktion,  
Gestaltung und Berechnung, Hanser

Steinhilper, Röper, Maschinen- und  
Konstruktionselemente 1 und 2, Springer

Naumann, Schröder, Bauelemente der Optik,  
Hanser Verlag

## Final exam

**Details**

Within the three-part examination the taxonomy ratings like understanding, appliance, analyzing, synthesizing and evaluating are examined.

Within the first part the students have to state their project which they had processed during the term. They have to exemplify the most difficult construction problems and how they have analyzed and solved them. They have to assess the chosen approach.

In the second part of the examination the students will get a freehand sketch, which have to be analyzed and to which they have to create a suitable 3D geometry model using a 3D design program and they have to make the engineering drawing with dimensioning.

In the third part of the examination construction problems have to be analyzed and based on the fundamental terms and on the technique presented in the lecture an appropriate solution has to be stated. The suitability of different construction solutions have to be assessed.

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**Minimum standard**

50 % of the questions out of all parts of the examination correctly answered correct construction and engineering drawing of the component part without any serious errors

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**Exam Type**

EN mündliche Prüfung, strukturierte Befragung

## – Lecture / Exercises

### Learning goals

<b>Goal type</b>	<b>Description</b>
Knowledge	basic skills of technical drawing composition of the engineering detail drawing drawing formats labelling field and list of parts arrangement of the views line types and line strength technical views engineering standards dimensioning normal dimensioning coordinate dimensioning sectional view representation of a thread surface specifications tolerances fitting position tolerances and form tolerances suitable for production constructiong and dimensioning
Knowledge	Three-dimensional construction Introduction to a 3D CAD program sketching basics sketching tools Project geometries work elements work points working axes work levels 3D elements extrusion rotation bores thread roundings subassemblies place components create components in assemblies replace components in assemblies create dependencies editing components in assemblies detailed drawings derive detail drawing from 3D component create Views dimension

### Special requirements

none

#### **Accompanying material**

Presentation slides for the lecture as pdf-files, exercise tasks as downloadable files

#### **Separate exam**

No

Knowledge construction elements in particular  
precision mechanics  
free from distortion lens holder  
scatter-resistant components  
beam drops

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Knowledge Materials and material science  
ferrous alloy  
non-ferrous metals  
synthetic materials  
special materials  
glassware  
ceramics  
surface refinement  
varnishing  
anodizing  
coating  
burnishing

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Knowledge manufacturing method  
turning  
milling  
drilling  
grinding

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Knowledge analysis of strain and mechanical  
strength  
fundamentals  
applications

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Skills to calculate  
the mechanical strength  
the raw material consumption  
the material costs

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Skills to define  
tolerances  
dimensions

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Skills to determine  
path of rays  
the material  
the manufacturing method

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Skills to assess  
surface quality  
dimensional accuracy  
feasibility of the construction

### Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Exercises (whole course)	1
Exercises (shared course)	0

Tutorial (voluntary)

0

## – Lecture / Exercises

### Learning goals

Goal type	Description
Skills	technical drawing
Skills	Create a 3D geometric model using a CAD program
Skills	Checking and evaluating the design in production-orientated manner
Skills	Check and evaluate strength simulation for plausibility
Skills	Recognizing and understanding interrelationships
Skills	analyse a constructive task analyze Independently recognized constructive tasks Analyze the given constructive tasks
Skills	design a solution approach for the constructive task Consideration of construction possibilities / resources Consideration of the available time quota
Skills	Presentation of a project outline Describe the task outline the approach
Skills	Milestone presentation to check the progress of the project Describe the task outline the approach Present results in a clearly structured way Discuss technical and scientific results
Skills	Final presentation with presentation of the realized solution approach Describe the task outline the approach Present results in a clearly structured way Discuss technical and scientific results

### Special requirements

none

### Accompanying material

oral discussions with project supervisor with individual references

### Separate exam

No

Skills            optional: realize basic optical  
                     structures yourself  
                     build  
                     adjust  
                     Carry out function test

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Skills            apply scientific / technical laws  
                     Calculating and drawing beam  
                     paths  
                     Estimate error influences  
                     Check the suitability of the  
                     construction, check the  
                     composition

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Skills            Work on complex technical tasks in  
                     a team  
                     Organize into subtasks  
                     Discuss measurement results  
                     complement each other  
                     meaningfully

### Expenditure classroom teaching

Type	Attendance (h/Wk.)
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Project	2
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Tutorial (voluntary)	0
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